Three New Species of *Aedes* from the Philippines (Diptera, Culicidae)[1]

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THIS IS THE TENTH PAPER of a series prepared by U. S. Naval personnel on mosquito collections made in the Philippine Islands under the auspices of Naval Medical Research Unit No. 2, and completes the description of the new *Aedes* species contained in that collection.

Aedes (Geoskusea) baisasi n. sp.

Fig. 1

ADULT:

MALE. Wing length approximately 2.5–3.0 mm. *Head:* Proboscis slightly longer than the fore femur, all dark-scaled. Palpus approximately 0.6–0.7 as long as the proboscis, exclusive of the labellum; dark; a very few stiff setae at the apices of the distal three segments and a few short hairs along the last segment. Vertex dorsally with broad dark scales, appearing paler along the eye margin, laterally with broad pale scales, usually a line of broad pale scales on the nape; an irregular line of dark upright-forked scales along the dorsal anterior margin of vertex, a patch of similar scales along the nape. *Thorax:* Scutal integument dark reddish-brown; clothed with narrow brown scales. Scutellum with a small patch of broad dark scales on the mid lobe, a very few narrow and broad dark scales on the lateral lobes. *Apn* bare of scales; *ppn* bare or with a few narrow and broadened dark scales dorsally, 2–4 posterior bristles, a few fine brownish hairs present ventrally. Propleuron bare. Sternopleuron with a dorsal patch of broad translucent brownish-white scales, these usually extending ventrally along the posterior margin, a considerable number of very fine short brownish hairs scattered over the remainder of the surface. Mesepimeron with a patch of broad translucent brownish-white scales, this patch being confluent ventrally with the dorsal hair tuft, a number of short brownish hairs present below the scale patch. Meteusternum (metanotum) with some fine pale hairs. Some of the pleural sclerites reddish-brown and markedly delimited by paler margins. *Legs:* Brown. The distal portion of the hind tibia and the basal portion of the first hind tarsal segment with outstanding narrow elongate scales on the inner surface. Fore tarsal claws unequal, large claw with one median and one basal tooth; small claw with a single subbasal tooth. Mid tarsal claws unequal, each with one subbasal tooth. Hind tarsal claws equal, simple. *Wings:* Brown-scaled. Halter stem pale, knob darker and with dusky scales. *Abdomen:* Tergites dark-scaled, lateral margin of I unscaled, a small baso-lateral pale scale patch on II–VII. Sternites pale-scaled basally, dark-scaled apically. *Genitalia:* Basal lobe of basistyle with sclerotized portion detached from basistyle tergally, many short thickened whip-like setae along mesal surface and with

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FIG. 1. *A. (Geoskusea) baisasi.* Tergal aspect of male genitalia.

much longer slender hairs on apex and for a variable distance basally. Ninth tergite lobes with 13–27 short stout peg-like spines and 1 or 2 bristle-like setae each.

FEMALE. Wing length approximately 3.0 mm. Largely similar to the male. Palpus approximately one-sixth to one-fifth as long as the proboscis. Tarsal claws equal, simple.

LARVA:

Unknown.

TYPES:

Holotype. Male (918.11), genitalia not separated, U.S.N.M. No. 59350, Iwahig Penal Colony, Palawan Island, Philippines, June 18, 1945 (J. L. Laffoon), collected as an adult from a crab hole at the edge of a mangrove swamp. *Paratypes.* Two males, 1 female, same data as for holotype; 11 males, 1 female, Pintanahon, Samar, April 13, 1945 (Laffoon); 1 male, Osmena, Samar, April 24, 1945 (Laffoon, Knight); 1 female, Zamboanga, Mindanao, September 12, 1945 (Laffoon, Johnson, Knight), taken from a light trap; 1 male, Zamboanga, Mindanao (Knight, Laffoon), September 15, 1945; 1 male, near Mangarin Bay, San Jose, Mindoro (Ross). All of the paratypes except the female from Zamboanga were collected as adults from the openings of crab holes in mangrove areas.

The holotype and a portion of the paratypes are deposited in the U. S. National Museum. The remainder of the paratypes are in the collections of the School of Hygiene and Public Health of the Johns Hopkins University, the California Academy of Sciences, and of the authors.

DISCUSSION:

Edwards (1932: 159) included *fimbripes* Edwards, *longiforceps* Edwards, and *tonsus* Edwards in the subgenus *Geoskusea*. In addition, he questioningly included *daliensis* (Taylor). Since that time, *daggyi* Stone and Bohart (1944:215) has also been added. In all of these species the male palpi are only about one-fourth as long as the proboscis.

In attempting to place the new species described above, we found that both it and the closely related *kabaenensis* Brug (1939:108) (formerly placed in *Skusea*) from the Celebes are similar to the known *Geoskusea* species in all important details except that the male palpi are approximately two-thirds as long as the proboscis. Since no other basic differences could be found, Edwards' (1932:159) definition of *Geoskusea* is hereby enlarged sufficiently to include these two species.

A. kabaenensis differs from *baisasi* mainly in possessing only 1–3 thick setae and 1–2 bristles on each lobe of the ninth tergite and in having the slender elongate hairs of the basal lobe of the basistyle confined to the apex of the lobe. The proboscis is described as being one and one-half times as long as the fore femur. Also, neither Brug's description nor the senior author's notes on the type of *kabaenensis*, which is in the British Museum, mention the occurrence of fine hairs on the mesepimeron below the scale patch. Unfortunately, no specimens of *bai-*

sasi were directly compared with the type.

It seems likely that when more material is available, *kabaenensis* and *baisasi* will prove to be members (subspecies) of a single polytypic species.

As pointed out above, *baisasi* and *kabaenensis* differ markedly from the other known *Geoskusea* species in having the male palpi approximately two-thirds as long as the proboscis. Also, conspicuous differences occur in the male genitalia.

This species is dedicated to Mr. F. E. Baisas, Malaria Control Section, Department of Health, Manila, Republic of the Philippines, who has contributed so materially to our knowledge of Philippine mosquitoes.

Aedes (Aedimorphus) mindoroensis n. sp.

Fig. 2

1929. *A.* (*Aed.*) *lowisi* Theo. Edwards, Not. Ent. 9:5.

1934. *Aëdes* (*Aëdimorphus*) sp. Edwards, footnote, in Barraud, Fauna Brit. Ind., Dipt. 5:250. Called attention to the fact that material named as *lowisi* by Edwards (1929:5) in actuality represents another species.

ADULT:

MALE. *Head:* Proboscis coloration obliterated. Palpi longer than the proboscis by slightly more than the length of the apical segment; dark; segments IV–V down-tilted, numerous long hairs arising apically and all along IV and V. Vertex with a narrow area of narrow pale scales along the dorsal portion of the eye margins; remainder of vertex with broad yellowish-white scales; brown upright-forked scales over the whole dorsum. *Thorax:* Scutal integument brown; badly rubbed, with some small narrow brown scales, marked on either side with at least two small clusters of yellow scales, one on the anterior margin and the other on a line with the first and on a level with the scutal angle. Scutellar lobes covered with broad silvery-white scales. *Apn* with a few broad silvery scales; *ppn* bare. Propleuron, upper sternopleuron, lower posterior sternopleuron, and upper mesepimeron each with a small patch of broad silvery-white scales; a few narrow yellowish scales on the subspiracular area. *Legs:* Femora and tibiae each with an apical patch of silvery-white scales anteriorly. Fore and mid tarsi dark, hind tarsal segments II–V missing but a narrow area of apical pale scales on I. *Wings:* Dark-scaled. A spot of silvery-white scales at the base of the costal vein. Halter knob with dusky scales. *Abdomen:* Tergite I with a lateral band of silvery-white scales; III–VI with basal bands of white scales, VII–VIII removed with genitalia and scale coloration lost. Sternites with brownish-yellow scales basally, brown scales apically. *Genitalia:* Basistyle without lobes; tergal surface with numerous very small setae, these extending laterad to the large lateral setae; sternal surface with a regular longitudinal row of stout long hairs near to mesal margin. Dististyle distinctively shaped as figured. Ninth tergite slightly concave medially.

FEMALE. Differs from the male mainly as follows: Proboscis pale beneath from near base to shortly beyond middle. Vertex with

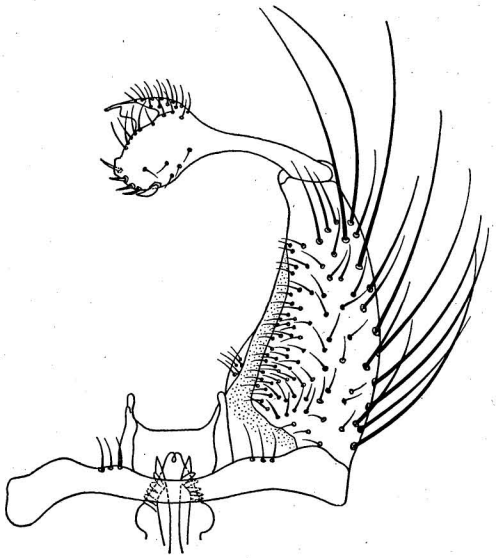

FIG. 2. *A.* (*Aedimorphus*) *mindoroensis*. Tergal aspect of male genitalia.

dorsum narrow-scaled, a median anterior diamond-shaped group of these dusky, the remainder golden; the lateral broad-scaled area creamy-yellow except for a dark patch at the dorsal margin and sometimes one on a level with *apn*. Scutum with yellow scales scattered over whole surface, in addition conspicuous aggregations of these scales occurring along anterior border, on the antero-lateral area, above the wing base, and on the prescutellar area. *Apn* with a few narrow yellowish scales; *ppn* with a few dark narrow scales dorsally. Subspiracular area with a few dusky hairs. Fore tarsus with a few pale basal scales on III, with pale yellowish scales basally and apically on IV, V all pale yellowish. Mid and hind tarsi with narrow basal pale yellowish bands on II–IV, similar apical bands on I–IV, V all pale yellowish. Tergites with a baso-lateral patch of silvery-white scales, the basal bands (which are variable in occurrence and width) either separate from these, or only narrowly connected. Sternites white or creamy, with broad apical brown bands.

LARVA:

Unknown.

TYPES:

Holotype. Male, genitalia separated (B.M. 1929–599 from Helsingfors Mus.), Calapan (erroneously printed "Calopan" on label), Mindoro Island, Philippines, February 1, 1916 (Böttcher collection). *Paratypes*. Four females, same data as for holotype. No habitat data given.

The holotype and all the paratypes are deposited in the British Museum (Natural History), from which they were generously loaned to us by permission of the Trustees.

DISCUSSION:

Edwards (1932:166) divided the subgenus *Aedimorphus* into eight groups. Later, Knight and Hurlbut (1949:29) modified this classification by combining Groups D and C. The new species described above is a member of this combined group, Group C (*alboscutellatus-albocephalus*), a group with numerous species in both the Ethiopian and Oriental Regions (some intrusions into the Australasian and Palaearctic Regions from the latter). The Pacific species of *Aedimorphus* belonging to this group are as follows: *alboscutellatus* (Theobald), *argenteoscutellatus* Carter and Wijesundera, *culicinus* Edwards, *jamesi* (Edwards), *lowisi* (Theobald), *niveoscutellus* (Theobald), *oakleyi* Stone, *orbitae* Edwards, *pampangensis* (Ludlow), *punctifemore* (Ludlow), and *senyavinensis* Knight and Hurlbut.

A. mindoroensis is most closely related to *lowisi*, a species that is known only from the Andaman Islands and from Morotai, Moluccas (this latter locality is a new record in Rozeboom, Knight, and Laffoon coll.). Externally, the adult of *lowisi* is indistinguishable from that of *mindoroensis*. However, the male genitalia of *lowisi* differs in having the narrow basal portion of the dististyle equal to no more than half of the total length and in being evenly slender instead of being rather broadly tapered, in having the short tergal setae in a rather narrow band along the mesal margin, and in lacking any special arrangement of the sternal setae of the basistyle. Although the types of *lowisi* have been examined by the senior author, no drawing was made of the ninth tergite so that it is not known if any differences occur there. Because of the nature of the similarities between these species, it seems likely that a single polytypic species is concerned. However, much more material must become available before this can be definitely determined.

A. orbitae Edwards is similar to *mindoroensis* but differs in having the tarsal bands broader and whiter, in having a basal band on hind tarsal I, and in the markedly different form of the dististyle. *A. jamesi* (Edwards) is distinct in having the tarsal bands basal only and in details of the male genitalia.

All of the other Pacific species of Group C differ most notably in possessing all dark tarsi.

Aedes (*?*) *platylepidus* n. sp.

ADULT:

MALE. Unknown.

FEMALE. Wing length 2.5–3.0 mm. *Head:* Proboscis dark, approximately equal to fore femur in length, apical portion may be somewhat laterally compressed. Palpus one-fifth as long as proboscis, dark. Torus with broad silvery scales medially. Vertex broad-scaled, dorsum black, an anteromedian patch of silvery scales that extends laterally as a line along the eye margins, extreme margin of lateral aspect with an area of palish translucent scales, a clump of short black upright-forked scales on the nape. *Thorax:* Scutal integument dark brown, covered with overlapping broad plate-like scales, these scales blackish-brown and possessing a metallic luster, only a very small central portion of the prescutellar space free of scales; a few bristles on the anterior margin and a clump over the wing base, but no prescutellar, dorsocentral, or acrostichal bristles. Scutellum completely covered with the same type of broad dark scale that is found on the scutum, the line between the scutum and scutellum completely hidden by the overlapping of the scutal scaling. Postnotum bare. *Apn* (not particularly approximated dorsally) covered with overlapping broad black scales; *ppn* bare of scales, about 3 posterior bristles. Pleural integument dark; paratergite very broad; postspiracular area with only 2–3 small hairs, 1 propleural bristle, only about 1 sternopleural bristle (located posteromedially), only a few dorsal mesepimeral hairs (nearly covered by scale patch; was not possible to be completely sure that no lower mesepimeral bristle occurs). Following areas each with a patch of broad overlapping silvery scales: propleuron, the anterior area between the fore coxae (prosternum), all of the sternopleuron except a small anteroventral area, and all of the mesepimeron except along the posterior margin. Base of meron slightly above base of hind coxa. *Legs:* Coxae anteriorly covered with overlapping broad silvery scales, some dark scales on mid coxa. Fore and mid femora anteriorly dark except for a small pale basal area and narrow white apical spots (may be absent on fore femur), posteriorly dark except for a basal pale area; hind femur white, apical one-third black except for a narrow white apical ring. Tibiae black. Fore and mid tarsi black except for a small dorsobasal white spot on I; hind tarsal segment I with a white band on slightly less than basal one-fourth (incomplete mesally), II all dark (a few basal white scales present), III dorsally all white except for a narrow apical area (extending onto lateral surfaces), IV–V all dark. Tarsal claws equal, simple. *Wings:* Dark-scaled. Dorsally the convex veins with small broad scales, the concave veins with narrow scales. Squama fringed. Bases of anterior and posterior fork cells approximately even. Vein 6 reaching distinctly beyond base of fork of vein 5. Halter pale, knob dark-scaled. On a wing of one specimen a hair was observed near base of vein 1. *Abdomen:* Tergites black-scaled, lateral margin of I with a silvery-scaled band, II–VI with basolateral silvery-white spots and narrow dorsobasal silvery bands (connected to the spots) on III–VI. Sternites with white basal bands. Eighth segment completely withdrawn into the seventh.

LARVA:

Unknown.

TYPES:

Holotype. Female (810.8), Puerto Princesa, Palawan Island, Philippines, May 24, 1945 (J. L. Laffoon and D. R. Johnson), reared from a tree hole larval collection. *Paratypes*. One female (1608.2), Cape Melville, Balabac Island, Philippines, June 23, 1945 (D. R. Johnson), reared from a larva collected in a fallen coconut spathe. One female (1620.1), Cape Melville, Balabac, June 23, 1945 (J. L. Laffoon), reared from a larval collection from a log depression in a mangrove area.

The holotype and one paratype are deposited in the U. S. National Museum. The

other paratype is in the collection of K. L. Knight.

DISCUSSION:

This species is strikingly different, on the basis of the broad plate-like dark (with metallic reflections) scutal and scutellar scales, from all other known Pacific *Aedes* species. In this respect, and in the absence of acrostichal, dorsocentral, and prescutellar bristles, it closely resembles another Philippine species, *Heizmannia scintillans* Ludlow. However, the generic characteristics of *Heizmannia* of having the anterior pronotal lobes (*apn*) closely approximated dorsally and the postnotum bearing a group of moderately long bristles apically are sufficient to exclude *platylepidus* from that genus. The American genus *Haemagogus* also has this type of scaling (and the same lack of scutal bristles) but, like *Heizmannia*, differs in having the anterior pronotal lobes closely approximated dorsally. *Aedes platylepidus* also shows a relationship with these two genera in having the base of the meron only slightly above the base of the hind coxa. In *Heizmannia* and *Haemagogus* these two bases are on a line, whereas in *Aedes* the base of the meron is (? always) well above the base of the hind coxa.

Although showing some resemblance to members of the genus *Armigeres*, this species differs in lacking prescutellar bristles, in the almost complete absence of sternopleural bristles, and in general habitus.

Lack of the male and larva of *platylepidus*, together with its rather aberrant characters, prevent the making of a definite decision at this time as to its subgeneric position in *Aedes*. In Edwards' (1932:131) subgeneric key to females, this species goes to *Macleaya*. This subgenus is based upon a single Australasian species, *tremulus* Theobald. However, *platylepidus* differs completely from this species in nearly all details of vertex, scutal, scutellar, and pleural scaling; and although no direct comparison of specimens has been possible, it seems quite unlikely that this species is at all closely related to *Macleaya*.

In general characteristics, this species seems to have much in common with the Ethiopian subgenus *Dunnius*. Perhaps the most striking correlation is the presence in this subgenus of several species that lack the scutal disc bristles, including the prescutellars, as does *platylepidus*. These are the only *Aedes* species recorded by Edwards (1932:174) as lacking these bristles. However, *platylepidus* is excluded from *Dunnius* by the simple female tarsal claws and in not having the proboscis distinctly longer than the fore femur.

Edwards (1932:179) questioningly (males unknown) places three Oriental species (*achaetae* Leicester, *discrepans* Edwards, and *tripunctatus* Theobald) in the genus *Haemagogus*, which on the basis of type descriptions seem to be similar to *platylepidus*. The type description of *discrepans* states that a postspiracular bristle is present, a condition which would seem to be sufficient to exclude this species at least from either *Haemagogus* or *Heizmannia*. An additional interesting fact is that *tripunctatus* has all simple tarsal claws in the female (Barraud, 1934:310).

Mr. P. F. Mattingly, British Museum (Natural History), has kindly compared a description of *platylepidus* with the types of *achaetae* and *discrepans* (*tripunctatus* not seen but apparently quite similar to *discrepans*). He reported that in general details they are much alike (particularly similar to *achaetae*). However, *discrepans* differs most notably in having both narrow and broad scutal scaling, thus resembling the subgenus *Dunnius*. Specifically *achaetae* differs in having at least the mid tarsal claws toothed and in lacking postspiracular bristles. He indicated that both *achaetae* and *platylepidus* show considerable general relationship with the genus *Heizmannia*.

REFERENCES

BARRAUD, P. J. 1934. *The fauna of British India.* (Diptera, Vol. 5, family Culicidae:

tribes Megarhinini and Culicini). 463 pp. Taylor and Francis, London.

BRUG, S. L. 1939. Notes on Dutch East Indian mosquitoes. *Tijdschr. v. Ent.* 82(1–2): 91–113.

EDWARDS, F. W. 1929. Philippine nematocerous Diptera—II. *Notulae Ent.* 9: 1–14.

——— 1932. Diptera: family Culicidae. *Wytsman's Fasc.* 194: 1–258. Brussels.

KNIGHT, K. L., and H. S. HURLBUT. 1949. The mosquitoes of Ponape Island, Eastern Carolines. *Wash. Acad. Sci., Jour.* 39(1): 20–34.

STONE, A., and R. M. BOHART. 1944. Studies on mosquitoes from the Philippine Islands and Australasia (Diptera: Culicidae). *Ent. Soc. Wash., Proc.* 46(8): 205–225.